Erratum and Addendum: *A unified model with a generalized gauge symmetry and its cosmological implications*, (J. P. Hsu and K. O. Cottrell, Chin. Phys. C, 39(10): 105101 (2015))

The phase $P_\omega(x)$ defined by Eq. (3) in the paper associated with the generalized U_{1b} symmetry should be corrected and completely specified as follows:

$$P_\omega(x) = g_b \int^{x} \omega_\lambda(x')\mathrm{d}x'^{\lambda}, \tag{1}$$

$$\rightarrow \quad P_\omega(x) = g_b \left(\int_{x'_o}^{x'_e=x} \omega_\lambda(x')\mathrm{d}x'^{\lambda} \right)_{Le}.$$

The subscript Le denotes that the 'Lagrange equation'

$$\mathrm{d}\omega_\lambda(x') - \frac{\partial \omega_\mu(x')}{\partial x'^{\lambda}}\mathrm{d}x'^{\mu} = 0, \tag{2}$$

is satisfied by the path. It is obtained from the variation of P_ω. Equations (1) and (2) imply that P_ω is independent of the path and is a local function of x, so that the second equation given by (3) in the paper, i.e., $\partial_\mu P_\omega(x) = g_b\omega_\mu(x)$, can be derived unambiguously. In the literature, such a new phase P_ω is called 'Hamilton's characteristic function,' which was discussed by Yourgrau and Mandelstam [1] and by Landau and Lifshitz [2]. Thus, $\exp(iP_\omega)$ is a Hamilton's characteristic phase factor rather than a non-integrable phase factor.

Since the paper discussed accelerated cosmic expansion and the rotational dumbbell universe, it appears more appropriate that physical laws can also be formulated and understood in non-inertial frames. Thus, it is worthwhile to note that the formulation and discussions of the baryon-lepton dynamics in section 2 can be carried out in linearly accelerated frames and rotational frames based on a broad four-dimensional symmetry [3] with the principle of limiting continuation of physical laws [4].

References

1 W. Yourgrau and S. Mandelstam, *Variational Principles in Dynamics and Quantum Theory* (Third edition, Dover, 1979), p. 50

2 L. Landau and E. Lifshitz, *The Classical Theory of Fields* (Cambridge, MA. Addison-Wesley, 1951), p. 29

3 J. P. Hsu and L. Hsu, Phys. Lett. A , **196**: 1 (1994)

4 J. P. Hsu and L. Hsu, Eur. Phys. J. Plus, **128**:74 (2013)